15 THE PROGRESS OF CHINESE MEDICINE IN TAIWAN

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Introduction

Owing to political turmoil, Japanese occupation and early economic hardship, the long envisioned organized educational and research programs in traditional Chinese medicine (TCM) in Taiwan did not take root until the l95Os. The development programmes started several years after Taipei became the site of the Nationalist government even though traditional Chinese medicine had long been an integral part of the rich heritage of the Chinese culture. In Taiwan its practice was officially recognised in March 1956 with the passing of the Chinese Medicine Education Act. The Act established educational and research institutions for the development of TCM to be an integral part of the overall modernisation of Taiwan's medical care. It is given the same status, support and fair share of available resources as orthodox medicine. Nonetheless, the path to respectability and acceptability among the general public, academic and healthcare professionals has been arduous. This chapter offers a brief history and major achievements in the history of TCM so far.

The Development of Education and Training of Chinese Medicine

THE DEVELOPMENT IN CHINA MEDICAL COLLEGE

The history of TCM development began with the creation of the China Medical College in Tai Chung in the early 1950s. The Ministry of Education formally recognised the College in June 1958. Subsequently, the pace of development quickened by 1973 when the Basic Medical Sciences department was built. In the same year, the Faculty of Public health was created to offer postgraduate programmes leading to

Master's degree for Pharmacy in the spring of 1974 and TCM in the following year. In 1977, orthodox medicine education and training was for the first time, offered to practitioners of TCM.

To accommodate the increasing demands for TCM, the College was moved in February 1983, to a more spacious campus in Pei-Kang. This lead to the establishment of a post-graduate programme in TCM and to the building of an affiliated hospital thereafter to support the clinical parts of the TCM programmes.

TCM continued to evolve satisfactorily with doctoral degree being offered in 1987. December 1991 marked the beginning of a new phase in the progress of TCM in Taiwan. An exhibition Hall for TCM was opened. This was quickly followed by the offer of doctoral degree at the Graduate Institute of Chinese Medicine and Chinese Pharmaceutics. Near the end of the twentieth century, TCM was gaining both stature and physical growth. The affiliated hospital built earlier in Taichung and mentioned above was designated a medical centre, an accolade befitting the continuing growth of TCM in Taiwan.

From the founding premises of the China Medical College to promote education and training of Chinese medicine till the present time, the modernization of traditional Chinese Medicine and the integration of East-West Medicines have been the unwavering guiding principle. From the early joint East-West medical and pharmacy curricula to today's 12 faculties, 6 graduate departments, 2 affiliated teaching hospitals the China Medical College has evolved to be a multidisciplinary all-round educational, research and health-care institution. The development of a healthy system permits the expansion and attainment of objectives. The Government and various business sectors have translated the high respectability commanded by Board Chairman Li-Fu Chen into strong and unwavering support. Soon after his appointment the Basic Medical Sciences Building was erected. Unprecedented loans from the Government and donations from the business sectors enabled the building of the affiliated hospital, elevating basic and clinical medical education to a World-caliber level. On July 1 1997 the affiliated hospital in Taichung gained candidate status for Medical Center designation.

To date, Taiwan has five major institutions offering undergraduate and post-graduate programmes and a range of exciting research projects such as pharmacokinetics, phytochemistry, toxicology, signal transduction, diabetes, cardiovascular and central nervous system pharmacology as well as receptor dynamics. These institutes were established:

THE DEVELOPMENT IN CHANG GANG UNIVERSITY

This University was founded in April 1987 as the Chang Gang Medical College. Adequate funding, good incentives and facilities allowed it to quickly become a leading teaching and research center in Taiwan. Following years of offering top-notch medical services largely in the orthodox medical mode by its affiliated hospitals, a Department of Traditional Chinese Medicine has been established in recent years in response to popular demand. Consequently the proper training of practitioners of traditional Chinese medicine attracted the attention of the policy-makers. Following lengthy research, discussions and preparations, the Faculty of Traditional Chinese Medicine was established in the fall of 1998

THE DEVELOPMENT IN NATIONAL YANG-MING UNIVERSITY IN TAIPEI

The National Yang-Ming University was founded in 1975 as the National Yang-Ming Medical College with the intention of training and eventually providing health care professionals for rural areas and the veterans' hospitals. According to the "Universities and Technical Colleges Act" post-secondary colleges enjoy the same statuses as universities. The granting of university status merely reflects the diversification in academic programmes. The National Yang-Ming Medical College quickly established a reputation as one of the leading medical colleges in Taiwan. The Department of Pharmacology was among the original academic departments which established and attracted the services of several renowned pharmacologists. Research projects on orthodox and Chinese medicinal aspects include pharmacokinetics, phytochemistry, toxicology, signal transduction, diabetes, and cardiovascular and central nervous system pharmacology and receptor dynamics.

THE DEVELOPMENT IN THE INSTITUTE OF TRADITIONAL CHINESE MEDICINE

Established in l99l, the Institute of Traditional Medicine at the National Yang-Ming University is the only institute devoted to the postgraduate teaching and research of traditional Chinese medicine (TCM) among national universities in Taiwan. Her main objectives include (1) training of teachers and researchers in TCM; (2) integration of TCM into mainstream health care and (3) modernization of TCM

along the lines of standardization, systematization of the practice of TCM. Research activities in the Institute are based on a multidisciplinary approach. Through cooperation with faculty members in other departments in the National Yang-Ming University and clinical researchers at the Veterans' General Hospital, innovative approach to the research of TCM is fostered.

Research training is available in subjects including the theory and practice of acupuncture, biophysical properties of TCM meridians and points, purification and identification of biologically active compounds from Chinese medicinal herbs, cardiovascular effect of TCM and effects of medicinal herbs on sperm motility, lipid peroxidation, virus and cancer cells. Ph.D. programmes were offered since the fall of 1998.

THE DEVELOPMENT IN THE INSTITUTE OF BIOPHARMACEUTICAL SCIENCES

The Institute of Biopharmaceutical Sciences at Yang-Ming University was established in 1994. Although the scope of teaching and research are in theory very broad and flexible, in practice efforts are intensely focused on disorders for which modern orthodox medical treatments are not very successful and those with high local incidence. The approach is the employment of cutting-edge technology, including those in molecular and cellular biology, for the investigation of neoplastic disorders, vascular disorders and those related to aging and the immune system. The hope is of international attention that will be drawn to the involvement of biopharmaceutical sciences for the development of products from genetic engineering, traditional medicine, health foods and supplements. Cooperation and collaboration with other departments and institutes at the National Yang-Ming University permits the Institute to offer diversified programmes both in teaching and research. The approved Center for Drug Development, which is envisioned to coordinate actions required for the full development of active compounds to marketable drugs, began operation in the fall of 1998.

Thus all the five institutes offer various aspects in research and training in Chinese medicine. These include subjects such as theory and practice of acupuncture, biophysical properties of TCM meridians and points, purification and identification of biologically active components from Chinese herbs, cardiovascular effect of TCM and the effects of medicinal herbs on sperm motility, lipid peroxidation, virus and cancer cells. Some institutes possess cutting edge technology for the modernisation of Chinese medicine.

Accreditation of Qualification of Chinese Medicine

Throughout the development of TCM in Taiwan, practical experience has been handed down from generation to generation. The Central Government, through the Executive Yuen, has taken steps to rationalise the standards of education, training and practice for TCM practitioners. Individuals can now be qualified in TCM under several conditions as described below:

a) The person must have sat and passed the Qualifying Examination in TCM administered by the National Examination Board. The prescribed subjects are Chinese, Biology, Physiology, Diagnosis, Materia Medica, Prescriptions and Internal Medicine. The compulsory subjects and elective subjects for Special Examination of TCM are: Chinese constitution, Physiology, Materia Medica, Prescription, Diagnosis Internal Medicine, Acupuncture, and Obstetrics, paediatrics, Ophthalmology and Traumatology. The successful candidates for the Special Examination are required to undergo eight months (52 credits) of basic orthodox medical and Chinese medical sciences training and ten months (42 credits) of Chinese medicine clinical training in the China Medical College.

b) Orthodox medical graduates who have successfully completed 45 academic credits in Chinese medicine (13 credits of Chinese Internal medicine, 6 credits of Chinese Materia Medica, 4 credits of Chinese medicine, and any 3 credits of Chinese obstetrics, paediatrics, Ophthalmology, Surgery and Traumatology) can sit for the National Board Examination. The compulsory subjects for TCM are Chinese, Materia Medica, Prescription, Diagnosis, Internal Medicine and Acupuncture while the elective subjects are Obstetrics, Paediatrics, Ophthalmology, Traumatology and Surgery.

c) Graduates from an accredited Post-Baccalaureate 5 year Medical Programme in TCM, 7-year Medical Programme in TCM, 8 year combined TCM and Orthodox Medical Programme, or Orthodox Medical Graduates upon completion of a Master's Programme in TCM with a minimum of 27 credits in TCM are also allowed to sit for the National Board Examination for the TCM practitioners.

Taiwan has come a long way since it launched its first TCM programme in the early 1950s. Today, it boasts 4 public medical universities or colleges, 6 private medical colleges and two technical colleges of pharmacy. It has about 3430 licensed TCM doctors for its 21 million people. This nevertheless compares very unfavourably with 23150 licensed orthodox doctors.

Development of Research in Chinese Medicine

THE NATIONAL RESEARCH INSTITUTE OF CHINESE MEDICINE (NRICM)

The NRICM was created in 1957 through a government decree, under the direct auspices of the Ministry of Education (Chen, 1989; Chen, 1998). The institute is committed to the advancement of TCM through organisation, research, education, experimentation, development and other related activities. In 1996, two research buildings were added to the NRICM. The following year a 400-acre National Arboretum of Medicinal plants was established in Taipei County. The NRICM now boasts the following research sections:

a) Basic Chinese Medicine Unit consisting of Medicinal Plants and Pharmacognosy, Pharmaceutical Chemistry and Clinical Chinese Medicine.
b) Information Section consisting of National Arboretum of Medicinal Plants Museum, Library, and Computer Information Centre.
c) Archives of Chinese Pharmacopoeia and Department of Graphics and Medical Arts.
d) Medicinal Plants Quality Control Centre, and
e) Biological Activities Screening Centre

The research mission of the NRICM focuses on the isolation and identification of biologically active principles from natural products. These include those of marine origin, synthesis of purified compounds and their derivatives, testing of these compounds for potential use in the treatments of liver diseases including hepatitis, neurodegeneration, neoplastic diseases and other disorders related to ageing and the immune system. Modern techniques and tools such as NMR, IR, FT-IR, GC/MS, LL/MS, LL/MS/MS, preparative and analytical high performance liquid chromatography, tissue cultures, bio-molecular techniques, electro-physiology and flow cytometry are routinely employed.

In addition, the NRICM organises intramural, regional, national and international symposia, providing a forum for the exchange of ideas, co-ordinates research activities with collaborating institutions and between academia, industry and government. Its publishing arm organises, revises ancient pharmacopoeia and publishes them in modern language. It also publishes other books, newsletter and periodicals related to research in

TCM. The NRICM's information service branch establishes and constantly updates databases of research information and is usually dispensed free of charge to interested parties. In order to increase public awareness and retail handlers of Chinese medicinal products who may have already had many years of experience but had inadequate theoretical training, the NRICM organises continuing education programmes in modern pharmaceutical practices. Although not directly involved in policy making, the NRICM provides consultation to relevant government offices. The goal is to establish a centre for all activities related to the advancement of TCM complementary to orthodox medicine as part of the modern health care resources. The task is enormous and daunting but the NRICM, along with its colleagues in academia, industry and government, is steadfastly contributing towards that goal.

GENERAL STATUS OF RESEARCH IN CHINESE MEDICINE AND NATURAL PRODUCTS

The tradition of research in TCM in Taiwan dates back to the days of Japanese occupation. Today, Taiwan has an active research community of pioneers and research fellows. There are many eminent researchers whose contributions have helped to gain international recognition for Taiwan's TCM research portfolio. The scope of this chapter does not allow listing all these pioneers but wishes to acknowledge their invaluable contributions. Instead a representative selection of research projects will be highlighted to emphasize how TCM was enhanced. The names of individual researchers initially written by the authors were intentionally left out by the Editors to offer an objective perspective and to avoid any cause of offence.

Early efforts

An early review of research activities on natural products (Lee, 1982) indicated that many aspects were related to Chinese medicinal products.

- Some were performed at a well known privately owned establishment (Brion Research Institute), where research in pharmacognosy, phytochemistry and pharmacology and quality control of CM materials was carried out.
- Early work on TCM materials at the Faculty of Pharmacy of the China Medical College (CMC) included, anthelmintic, expectorant and antitussive effects of some the TCM. Other published works

were"Medicinal Botany", "Medicinal Plants of Taiwan", "Toxic Plants of Taiwan" and the therapeutic uses of Chinese Medicines in the treatments of cancers, poisonous snakebites and kidney diseases.

- At the Kaohsiung Medical College, 20 bioactive alkaloids from plants indigenous to Taiwan were isolated that had potential antibiotic and anti-neoplastic effects. Of these 7 had antibiotic effects and 9 cytotoxic among 70 alkaloids screened.
- The Institute of Botany at Academia Sinica worked on the isolation of antibiotic materials from Taiwanese soil.
- The Faculty of Medicine of Chung-Kung University studied the antipyretic effects of Chinese medicines and quantitation CM products using high-performance-liquid-chromatography and development of derivatives of glycerretinic acid.
- The Faculty of Pharmacy at the National Taipei University worked in steroids and terpenes, and studied the biological activities of anticancer principles from natural products as well as their syntheses. Work has also been aimed at the biological activities and synthesis of alkaloids from natural products and succeeded in the isolation and confirmation of the chemical structures of discretamine, stepholidine, and govadine. Others were on the isolation of alkaloids from *Uncarica hirsuta* Haviland for their anti-hypertensive mechanisms, anticancer activities of active principles from Chinese medicines and seaweed and characterisation of the anticancer protein isolated from *Absurd precatorius* L.
- At the National Yang-Ming Medical College, works were directed at the screening and confirming the anti-hypertensive, analgesic and antipyretic effects for a number of Chinese medicines and studied the diuretic effects of *Orthosiphonis Herba, Plantaginis Semen, Evodiae Fructus* and *Drabae Semen*.
- The Taipei Medical College pioneered the isolation of bioactive alkaloids from Taiwanese plants with more than 70 related articles, the antibacterial effects of 35 coumarins and the relaxant effects of butylidenephalide on smooth muscles.

Lee also pointed out (Lee, 1982) that the main obstacle in research in natural products in Taiwan lay in the lack of support from the pharmaceutical industry, financial support from the government and individuals and lack of interest on the part of doctoral students. In the last few years' research, Traditional Chinese Medicine in Taiwan has received a big boost from the fine efforts from various institutes. (Chen, 1988a, Chen 1988a and Chen 1989).

Recent progress in research of Chinese medicinal plants

In the 1970s The National Science Council in Taiwan initiated research programmes in anticancer potentials in Chinese medicines with core researchers recruited from the NDMC. In recent years under the auspices and support from the National Science Council and the Ministry of Health other experts from the NYMU, TMC, Kaohsiung Medical College, CMC and even the Tatung Technical College have helped to realize these goals. The pledging of substantial support from the Ministry of Education in 1988 breathed new life to research activities at the NRICM. Having enjoyed international recognition in its research in snake venom, the Research Institute of Pharmacology at the NTU has also branched into TCM research. At the same time the cross-Strait relationship between Taiwan and Mainland China has improved, allowing scholarly exchanges and fueling the pace of TCM research. Recently the Executive Yuan has assigned greater responsibilities to the NRICM in working closely with Taiwan's own National Health Research Institute (NHRI) and the National Science Council to expand TCM research in Taiwan with the development of new drugs as a designated goal.

Recent results were reported (Teng, 1991, Teng & Liu 1991) that in more than a hundred of Chinese medicinal herbs screened, approximately 10% were found to possess anti-hepatitis virus potentials. Others possessed central effects, some acted on the cardiovascular system, and some possessed anti-inflammatory actions. The following list summarises the names and actions of these plants.

- *Daphne odor* Thumb. var. *atrocaulis* Rehder (白花瑞香), *Caesalpinia sappan* L. (蘇木), *Syzygium tripinnatum* (Blanco) Merr. (大花赤楠), *Peucedanum japonicum Thunb.* (日本前胡), *Ganoderma lucidum* (Leyss ex Fr.) Karst. (fruiting body) (靈芝子實體), *Poria cocos* (Schw.) Wolf. (茯苓), *Salvia miltiorrhiza* Bunge (丹參), *Dysosma pleiantha* (Hance) Woodson possess anticancer effect. (八角蓮), *Bupleurum chinense* DC. (柴胡), *Lonicera japonica* Thunb. (金銀花), *Physalis angulata* L. (若蘵),) *Cordyceps sinensis* (Fruiting body) (冬蟲夏草, *Psoralea corylifolia* L (若蘵)., *Magnolia officinalis* Rehd. & Wils. (原朴) possess immunological regulation and anti-inflammatory effects.
- *Lycopodium serratum* Thunb. var. *longipetiolatum* Spring (金不換), *Lycopodium casuarinoides* Spring (木賊葉石松), *Corydalis yanhusuo* W.T. Wang (延胡索), possess central effect. *Lithospermum*

erythrorhizon S. et Z. (紫草), *Litsea cubeba* (Lour.) Persoon (山胡椒), *Rhamnus formosana* Matsum. (台灣鼠李), *Wikstroemia indica* C.A.Mey. (南嶺蕘花), *Zanthoxylum schinifolium* S. et Z. (翼柄花椒), *Corydalis ochotensis* Turcz. (疏花黃堇), *Murraya euchrestifolia* Hay. (山黃皮), *Zingiberis officinale* Rosc. (薑), *Melastoma affinie* Don. (蘭嶼野社丹), *Saposhnikovia divaricata* (Turcz.) Schischk. (防風), *Gentiana flavo-maculata* Hay. (黃花龍膽), *Epimedium sagittatum* (S. et Z.) Maxim. (淫羊藿), *Dendropanax pellucidopunctata* (Hay.) Merr. (台灣樹參),) *Acacia Polygonum cuspidatum* S. et Z (相思子)., possess antiplatelet aggregation effect.

- *Nymphaea tetragona* Georgi (睡蓮), *Aconitum carmichaeli* Debx. (烏頭), *Lindera megaphylla* Hemsl. (大香葉樹), *Dehaasia triandra* Merr. (腰果楠), *Cryptocarya chinensis* (Hance) Hemsl. (大香葉樹), *Evodia rutaecarpa* Hook. f. et Thom. (吳茱萸), *Melastoma candidum* D.don (野牡丹), *Fissistigma glaucescens* (Hance) Merr. (白葉瓜馥木), *Dictamnus dasycarpus* Turcz. (白鮮皮) had effects on the cardiovascular system and blood pressure.

A number of active principles have been isolated from these herbs and their chemical structures identified. These include dehydroevodiamine, evodiamine and rutaecarpine from *Evodiae Ruteacapae*. Their pharmacological profiles, mechanisms of actions as well as pharmacokinetics have been investigated. The development of the bioactive alkaloid aporphine is currently in progress. Not included in Teng's report are analyses by high performance liquid chromatography and capillary electrophoresis and pharmacokinetic studies, which have attracted international attention.

Reports on the progress between 1974 to 1991 (Chen, 1992; Chen, 1998c) described the work on steady advancements both in quantity and quality of studies on Chinese medicine in Taiwan, isolation and synthesis of bioactive compounds from medicinal plants, and procurement of four patents.

Since 1997 the screening of Chinese composite formulae (Fu Fang) for their inhibitory effects on inducible nitric oxide synthetase, amyloid beta-peptide secretion, amyloid beta-peptide binding to neurons, and PtdSer exposure on neurons, and antioxidant effects in the hope of finding potential neuro-protective agents has been a major research theme at NRICM (Chen, 1997). Examples of inter-institute collabora-

tion has been started at the National Taipei University's School of Medicine on Chinese composite formulae (Fu Fang) for the treatment of asthma which attracted the participation of experts in basic and clinical fields from various institutions.

Conclusion

The credibility and popularity enjoyed by orthodox medicine has been helped largely by organized and integrated approaches in education, research and systematic documentation of observations. However, increasingly the orthodox medical profession is becoming aware of merits in other forms of medical practice in the treatment of diseases, particularly certain disorders for which orthodox medicine has not been very successful. For many such ailments, symptomatic relief is probably the only means of relief. However, due to lack of organization and accurate documentation, many of these other forms of alternative medical practice are shrouded in mystery, impeding their acceptability. Traditional Chinese Medicine has always been an integral part of the Chinese heritage. With thousands of years of experimentation and accumulated observations, it is a rich source of information and clinical wisdom waiting to be rediscovered. Regrettably "the art of healing" in traditional medicine had been passed on only on a personal basis, relying heavily on clinical experience rather than meticulous documentation. Many "secret recipes" are lost. Organized education and research so that the merits of traditional Chinese medicine can be verified and accepted are much warranted.

There has been an enormous effort in Taiwan to validate by orthodox and conventionally accepted methodology, the ancient Chinese medical recipes for the treatment of a range of diseases. It is widely recognised that much has been focused onto the characterisation of the principal natural products through isolation and identification of their active constituents and then to develop them as new medicinal products. The benefit of such an approach is difficult to dispute in the scientific world. However, it ignores the original reason for combining medical herbs together and there is no question that under certain conditions various herbal mixtures may interact and potentiate the efficacy. Therefore, alternative clinical effectiveness evaluation methodologies should be developed for assessing composite prescriptions, which contain multiple herbal mixtures, as is the case for TCM and

many other traditional herbal medicines around the world. Thus, besides being used as health foods, partial purified natural products are now being seriously considered as medicinal products by the Food and Drug Administration (FDA) of the USA. Again, the clinical efficacy of well quality-controlled complete composite prescriptions containing multiple herbal mixture should be carefully evaluated (Way, Liu, & Chen, 1996).

In conclusion, there appears to be a long way to go for the right approach to confirm tradition by present day science. Both education and research are long term investments, the fruits of which are unlikely to be immediately achieved. It has been said that to cultivate a tree takes only 10 years but to cultivate a person would take 100 years.

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